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A NEW SPECIES OF *ENTEDONONECREMNUS* (HYMENOPTERA: CHALCIDOIDEA: EULOPHIDAE) PARASITIC ON THE GIANT WHITEFLY, *ALEURODICUS DUGESII* COCKERELL (HOMOPTERA: ALEYRODIDAE)

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Abstract.—***Entedononecremnus krauteri* new species** is described and illustrated. This species is a primary parasite of an invading whitefly, *Aleurodicus dugesii* Cockerell, and is the first parasite reared from that host in the United States. This parasite has been transferred to several parts of Texas and California as part of biological control efforts to regulate the whitefly.

Key Words: *Entedononecremnus krauteri, Aleurodicus dugesii,* Eulophidae, Chalcidoidea, Aleyrodidae, biological control.

Aleurodicus dugesii Cockerell (1896), commonly called the giant whitefly, was described from *Hibiscus* collected in Guanajuato, Mexico. This whitefly was first reported in the United States from Balboa Park, San Diego, California, in October 1992 (R. Gill, pers. comm.). *Aleurodicus dugesii* has since been discovered in Texas and Louisiana. Mound and Halsey (1978) list one genus from each of the plant families Annonaceae, Begoniaceae, Chrysobalanaceae, Malvaceae, and Moraceae as host plants, but the whitefly has been found on a number of different genera and families in the U.S.

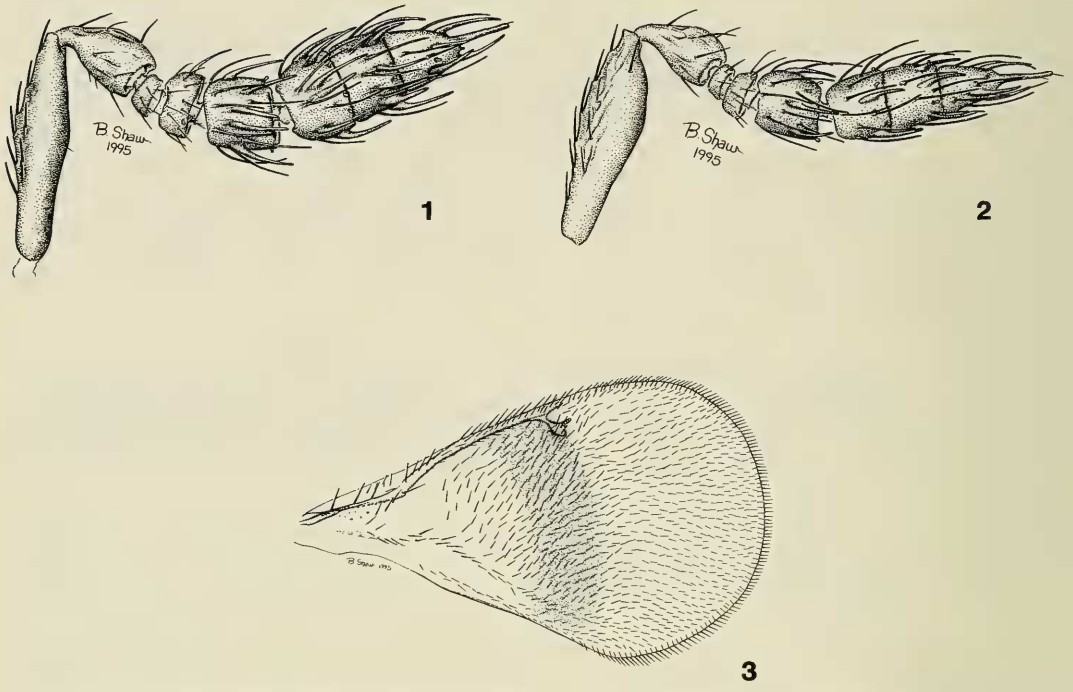
Parasites of this whitefly have not been previously reported. The serendipitous discovery of a parasite attacking giant whitefly in Texas represents the first recovery of a parasite of *A. dugesii* in the United States. The parasite is an undescribed species of *Entedononecremnus* Girault (Hymenoptera: Chalcidoidea: Eulophidae: Entedoninae) and is named here to facilitate its use in biological control efforts.

Entedononecremnus contains a single described species, *E. unica* Girault (1915), but additional undescribed species are known (LaSalle and Schauff 1994). Members of the genus belong in Euderomphalini, which contains all known eulophid whitefly parasites. LaSalle and Schauff (1994) provide an excellent systematic review of Euderomphalini, including a key to genera by which *Entedononecremnus* can be distinguished and a diagnosis of the genus.

Basic morphological terminology used here follows that of Schauff (1991). Following are abbreviations for institutions and collections: BMNH, The Natural History Museum, London, United Kingdom; CDFA, California Department of Food and Agriculture, Sacramento; CNC, Canadian National Collection, Ottawa, Canada; IIE, International Institute of Entomology, London, United Kingdom; SDCDA, San Diego County Department of Agriculture, San Diego; TAMU, Texas A&M University, College Station; UCR, University of California, Riverside; USNM, National Museum of Natural History, Washington, D.C.

Entedononecremnus krauteri Zolnerowich and Rose, New Species

Diagnosis. Specimens of *Entedononecremnus krauteri* can be separated from the



Figs. 1–3. *Entedononecremnus krauteri.* 1, Antenna, female, outer aspect. 2, Antenna, male, outer aspect. 3, Forewing, female.

only other described species in this genus, *E. unicus,* by the following characters: head and mesosoma with reticulate sculpture consisting of relatively wide cells (Figs. 5, 6), mesosoma dorsally convex in lateral view (Fig. 4), mesoscutum and scutellum each with several setae arranged in pairs (Fig. 6), and forewing with an infuscate band and short stigmal vein (Fig. 3).

Entedononecremnus unicus has reticulate sculpture with much finer cells (as in Fig. 38, LaSalle and Schauff 1994), the mesosoma is much less convex in lateral view, the mesoscutum and scutellum have numerous setae not arranged in pairs (as in Fig. 31, LaSalle and Schauff 1994), the forewing is hyaline, and the stigmal vein is elongate and shaped differently (as in Fig. 50, LaSalle and Schauff 1994).

Although *E. krauteri* is very distinct from *E. unicus,* it falls well within the range of variation noted by LaSalle and Schauff (1994) for the genus. They noted undescribed species of *Entedononecremnus* may vary in the number and arrangement of setae on the mesoscutum and scutellum, and in the length and shape of the stigmal vein. Undescribed species examined also have varying degrees of infuscation on the forewings. Although LaSalle and Schauff (1994) state that males of Euderomphalini lack pores within the ventral groove of the scape, such pores are evident in *E. krauteri* (Fig. 9).

Female. Length 0.98–1.17 mm. Head and body black with white or pale blue purple highlights; first gastral tergite metallic blue green, remaining tergites black with purple highlights. Scape and pedicel testaceous, funicular segments and club beige, apical spine on club black. Coxae black; trochanters dark brown; fore- and midfemora black, or black with the extreme distal portion testaceous, hind femur black with distal 1/7 testaceous; tibiae black in proximal 1/4–1/2, remainder testaceous to brown; foretarsi 1-3 tan to brown, foretarsus 4 brown to black, mid- and hind tarsi

1-3 white to testaceous, mid- and hind tarsus 4 brown to black. Forewing hyaline except for short basal infuscate streak below submarginal vein and infuscate band extending from distal half of marginal vein and stigmal vein to posterior margin of wing (Fig. 3); venation dark brown, parastigma varying from hyaline to brown.

Head with strong reticulate sculpture and without frontal or malar sulci (Fig. 5). Eye glabrous. POL:OOL 6:3. Mandible with 2 teeth, dorsal tooth longer than the ventral.

Scape slightly more than 4× longer than broad and widest in the middle, outer surface with very few setae, inner surface with numerous setae; pedicel 0.4× length of scape; flagellum composed of anellus, 2 funicular segments, and 3-segmented club with long apical spine; first funicular segment 1.7× broader than long and with a single multiporous plate sensillum on the inner side, second funicular segment subquadrate and nearly 2× length of first funicular segment, club slightly more than 2× length of funicular segments (Fig. 1).

Mesosoma dorsally convex in lateral view and slightly shorter than metasoma (Fig. 4), with strong reticulate sculpture dorsally (Fig. 6). Mesoscutum with 5 pairs of setae, notauli absent but mesoscutum with depressed areas on either side. Scutoscutellar sulcus deep. Axillae extending forward about 1/3 length of the mesoscutum. Scutellum slightly wider than long and with 4-6 pairs of setae. Midtibial spur setose (Fig. 8).

Forewing venation with proportions as follows: submarginal vein, 59; marginal vein, 37; stigmal vein, 10; postmarginal vein, 7. Submarginal vein with 3 setae proximal to parastigma (Fig. 3).

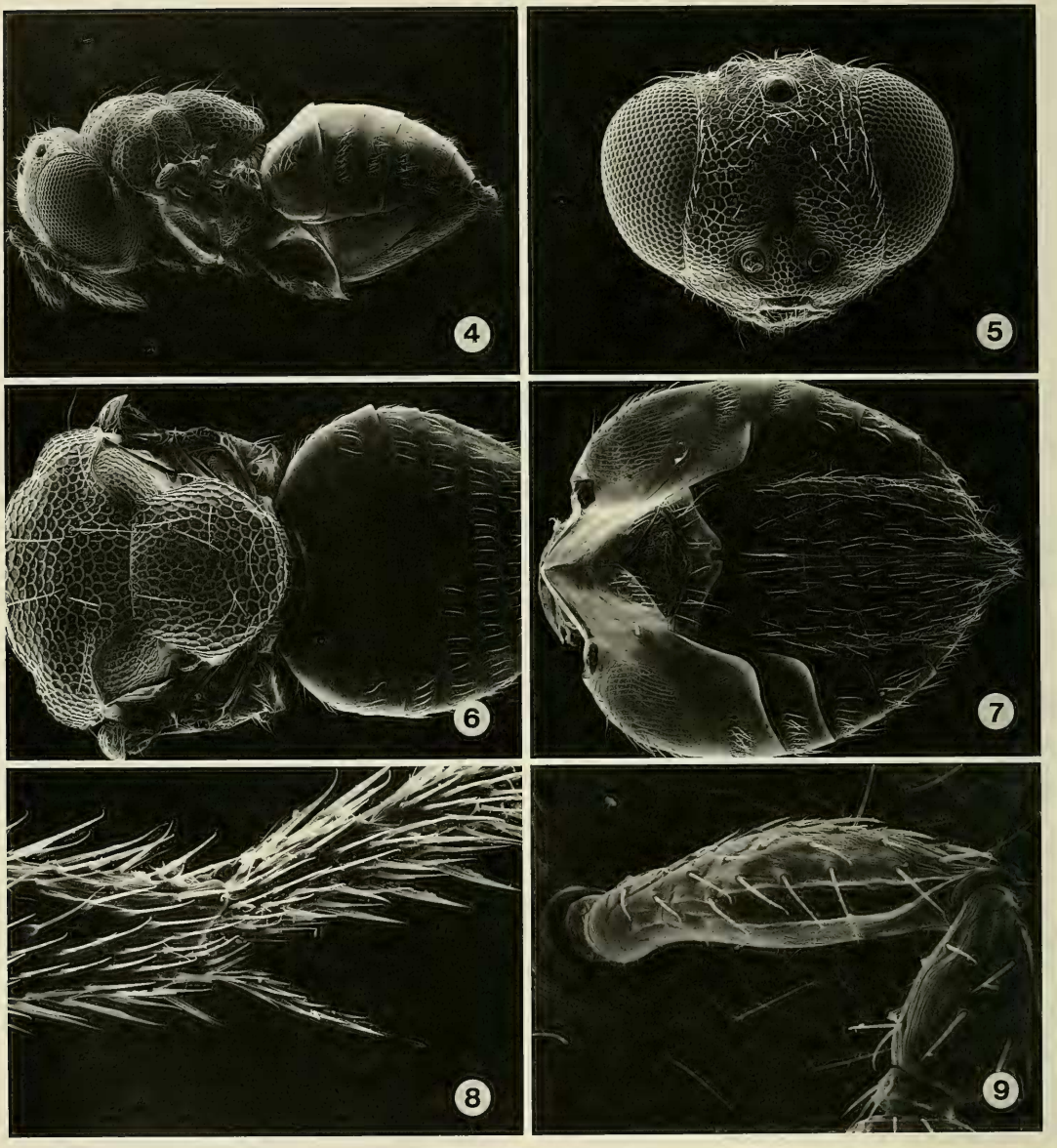
Gaster slightly longer than mesosoma, first gastral tergite the longest, polished dorsally (Fig. 6) and with lateroventral longitudinal striations (Fig. 7). Remaining tergites shorter and with fine transverse sculpture dorsally and short longitudinal striations ventrally. Sternites reduced in length and with a membranous area anterior to hypopygium (Fig. 7). Ovipositor 0.8× length of metasoma and slightly exserted.

Male. Length 0.99–1.14 mm. Similar to female but usually slightly shorter and less robust. Scape 3.3–4.0× longer than broad and with a ventral cleft containing pore openings (Fig. 9), second funicular segment slightly longer than broad and about 3× length of first funicular segment, club 2.5× length of funicular segments (Fig. 2).

Notes. Entedononecremnus krauteri is a primary parasite of *Aleurodicus dugesii.* No other hosts are known. Initial field collections of adults associated with *A. dugesii* on *Hibiscus syriacus* L. made on October 10, 1995, were heavily male-biased. Leaves bearing parasitized whitefly held in the lab produced parasites of both sexes, with a female:male sex ratio of 5.6:1. Adults emerge from fourth-instar whitefly larvae. A female videotaped during emergence took over 1.5 hours to chew the exit hole and emerge from the host. Adults emerge with the pupal exuviae still enveloping their antennal clubs. The exuviae are removed with the forelegs shortly after emergence.

The giant whitefly attacks 43 plant genera in 35 families in San Diego County, California (D. Kellum, pers. comm.). Approximately 3400 parasites reared at TAMU and shipped to San Diego County were colonized at 11 different sites in that county during October 1995. Host plants on these sites included *Aralia, Citrus, Cucurbita* (Chayote squash), *Geranium, Hemerocallis* (daylily), *Hibiscus, Persea* (avocado), and *Xylosma.* Adult parasites were still present in the field 10 days after colonization. *Entedononecremnus krauteri* has successfully overwintered and reproduced in San Diego County, and will be evaluated for efficacy in biological control of the giant whitefly (C. Pickett, pers. comm.).

Additional parasites were released at three sites in Texas that included plants grown indoors. These sites were the San Antonio Botanical Garden (800 parasites), Houston Museum of Natural Sciences



Figs. 4–9. *Entedononecremnus krauteri.* 4, Habitus, female. 5, Head, female. 6, Mesonotum and metasoma, female. 7, Metasoma, female, ventral view. 8, Midtibial spur, female. 9, Scape, male, ventral view.

Cockerell Butterfly Center (400 parasites), and the Fort Worth Botanical Garden (60 parasites). *Entedononecremnus krauteri* was later found attacking giant whitefly on *Hibiscus* growing outdoors at the San Antonio Botanical Garden. It remains unknown if *E. krauteri* is native to North America or if this is a case of fortuitous ecesis (DeBach 1971).

Etymology. Named in honor of P. C. Krauter, who found the parasite and its host in his hometown of Comfort, Texas.

Types. Holotype female mounted on a card, "Texas: Kendall Co., Comfort, Altgelt Ave., 10.X.1995, G. Zolnerowich" "*Aleurodicus dugesii* on *Hibiscus syriacus*". Holotype deposited in USNM. Twenty-three female and 18 male para-

types with same data as holotype deposited in BMNH, CDFA, CNC, TAMU, UCR, and USNM.

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